

TECHNICAL MEMORANDUM

Utah Coal Regulatory Program

FILED

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**SECRETARY, BOARD OF
OIL, GAS & MINING**

January 11, 2016

TO: The Utah Board of Oil, Gas, and Mining

THRU: Dana Dean, Associate Director
Daron Haddock, Program Manager

FROM: Amanda Daniels, Hydrologist

RE: Crandall Canyon Mine Discharge Water Board Update, Docket No. 2010-026,
Cause No. C/015/0032

SUMMARY:

Attached please find the Division of Oil, Gas and Mining's six month update report on the total iron concentrations in the mine discharge water at the Crandall Canyon Mine. This report is submitted in compliance with the January 28, 2013 Board Order.

Crandall Canyon Mine Hydrologic Evaluation Update

January 11, 2016

Introduction

The Division of Oil, Gas and Mining (the Division) completed a Hydrologic Evaluation of the Crandall Canyon Mine Water Discharge in June 2010. Since that time, numerous reports have been prepared by the Division and Genwal Resources, Inc. (Genwal) that examine the mine discharge water at Crandall Canyon. In compliance with the January 28, 2013, Board of Oil, Gas and Mining (the Board) Order¹, the following report presents an update on the data collected through December 2015. The report will focus on data collected since approximately January 2010 (after total iron concentrations in the discharge peaked). The following sections of this updated report describe: the data currently being collected, plots which have been prepared to examine the data, and a recent data evaluation. Due to potential changes to the Genwal UPDES permit, a predictive compliance analysis was not conducted. This will be discussed further in the report.

Sampling

Genwal has continued to perform monthly sampling and analysis of the mine discharge water in accordance with the Crandall Canyon Mining and Reclamation Plan (MRP). In addition, Genwal has been collecting laboratory analysis samples more frequently than required by the MRP and has also been sampling the discharge using a total iron field analysis. The sampling is conducted to evaluate the need for continued treatment of the mine discharge water in order to meet the 1.24 mg/L maximum daily effluent limitation (MDEL) for total iron in accordance with their Utah Pollutant Discharge Elimination System (UPDES) permit. In addition, treatment is required for compliance with the narrative standard of Section I.C of the UPDES permit.

In October 2012, Genwal installed a new continuous flow sampling port and began collecting samples at this port. In March 2013, the continuous flow sampling port was destroyed by a rock fall from a high wall. After consultation with the Division, a new continuous flow sampling port was installed in March 2013. For purposes of this report, data from both continuous flow sampling ports will be viewed as equivalent. All samples taken since March 2013 were collected at the new continuous flow sampling port.

Current Data Graphs

Untreated total iron concentrations from January 2007 through December 2015 are plotted in Exhibit 1. The monthly median total iron concentrations from January 2010 to December 2015 are plotted in Exhibit 2. Exhibit 3 shows only the continuous flow sampling port, monthly median total iron concentrations, from October 2012 to December 2015. Average mine discharge flow rates are displayed in Exhibit 4. Total iron concentrations after treatment are shown in Exhibit 5. Mine discharge water chemistry analytical results from January 2007 to December 2015 and monthly medians for total iron are tabulated in Exhibit 6.

Recent Data

The total iron concentrations, collected from June to December of 2015, have fluctuated as low as 1.16 mg/L and as high as 1.54 mg/L, with a six month average concentration of 1.35 mg/L and a standard deviation of 0.14 mg/L. Comparing this information to the previous 5 months, the average total iron concentration has decreased, and the standard deviation has stayed about the same. This is a good improvement in total iron concentrations compared to the previous year of data.

Compliant Discharge

Mine discharge water samples collected from June 2015 thru December 2015 reported 5 total iron concentrations, in October, November and December, at or below the MDEL of 1.24 mg/L, as defined in Genwal's UPDES permit. This is an encouraging decrease in total iron concentration.

The UPDES permit was re-issued on May 1, 2011, and will expire on April 30, 2016. During UPDES permit renewals, the MDEL of each effluent parameter as outlined in the discharge permit (Section I.D), are re-calculated by the Utah Division of Water Quality (DWQ). These MDEL re-calculations are conducted using a standardized method that evaluates the most recent data available for the effluent receiving stream. Through recent discussions between the Division and DWQ, they have indicated that the effluent limit of total iron at Genwal is likely to change, and may increase or decrease.

Potential impacts to the treatment of mine water, especially if the MDEL for total iron is lowered, could be significant. Due to these upcoming changes, it did not seem prudent to make any conclusions about the continued treatment of mine water until after the UPDES permit is renewed. The mid-2016 hydrologic update will include an evaluation based on this new MDEL of total iron.

Conclusion

With the currently available data, and potential changes to the MDEL of total iron, the Division feels that it is prudent to continue collecting data to support accurate evaluations of total iron trends. The new decrease in total iron concentrations is encouraging and should continue to be closely watched. The Division recommends continuing to compile total iron concentration evaluations every six months based on newly available data. The continued treatment of mine water discharge is also highly dependent on the MDEL of total iron concentrations in the UPDES permit. Once the UPDES permit is renewed, the Division will have a better understanding of what the future of the treatment system could entail.

References

1. Board of Oil, Gas and Mining., Findings of Fact, Conclusions of Law and Order, Docket No. 2010-026, Cause No. C/0150032, January 28, 2013.
2. Petersen, E.C. 2011. Investigation of Iron Concentration in the Genwal Resources, Inc. Crandall Canyon Mine Discharge Water, November 7, 2011
3. Gilbert, R.O., 1987. Statistical methods for environmental pollution monitoring. Van Nostrand Reinhold, New York.
4. Perry and Rauch. Estimating Water Quality Trends in Abandoned Coal Mine-pools, Presented at West Virginia Mine Drainage Task Force Meeting (sourced online as a white paper), March 26-27, 2013, Morgantown, WV

Exhibit 1

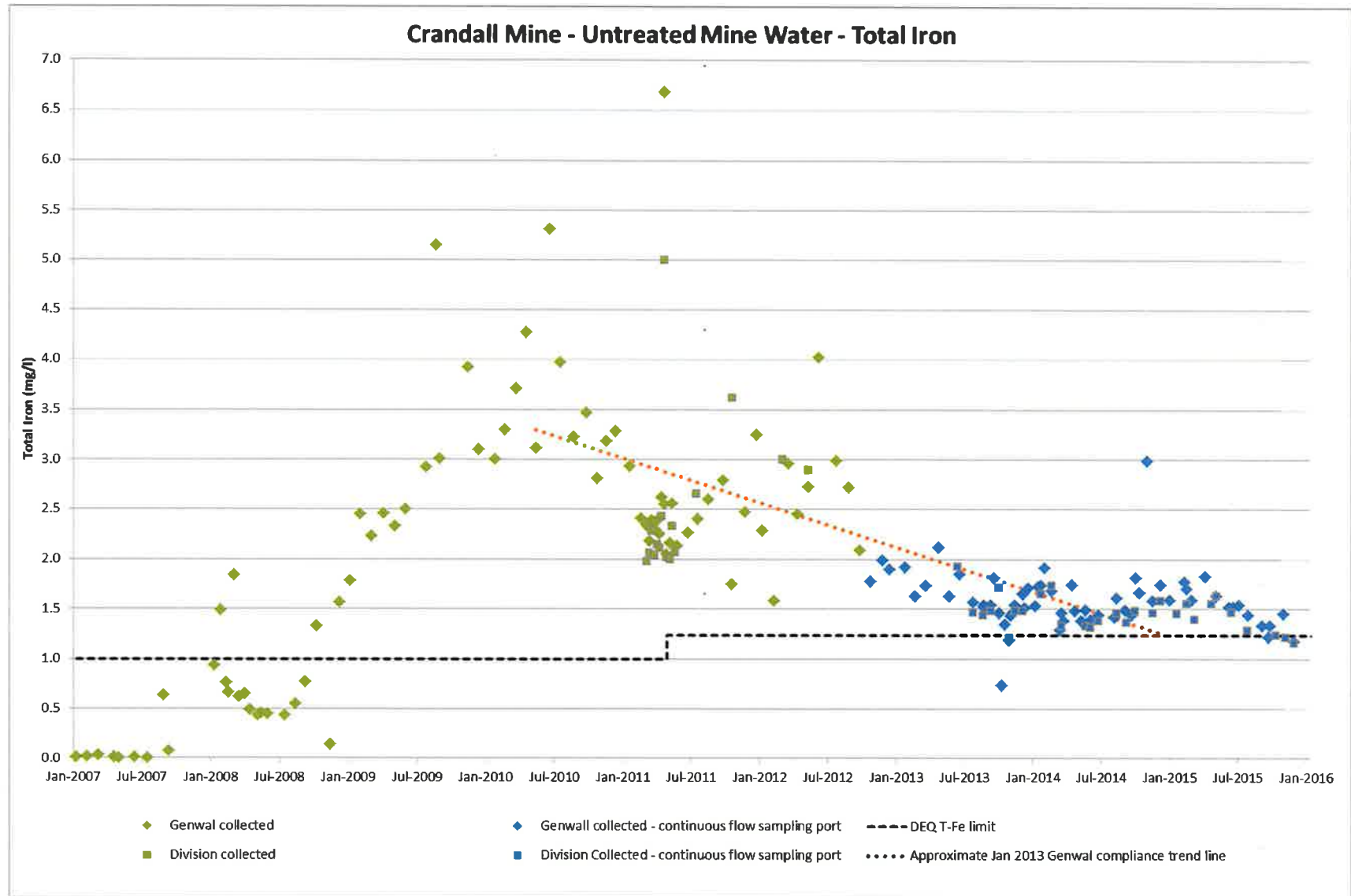


Exhibit 2

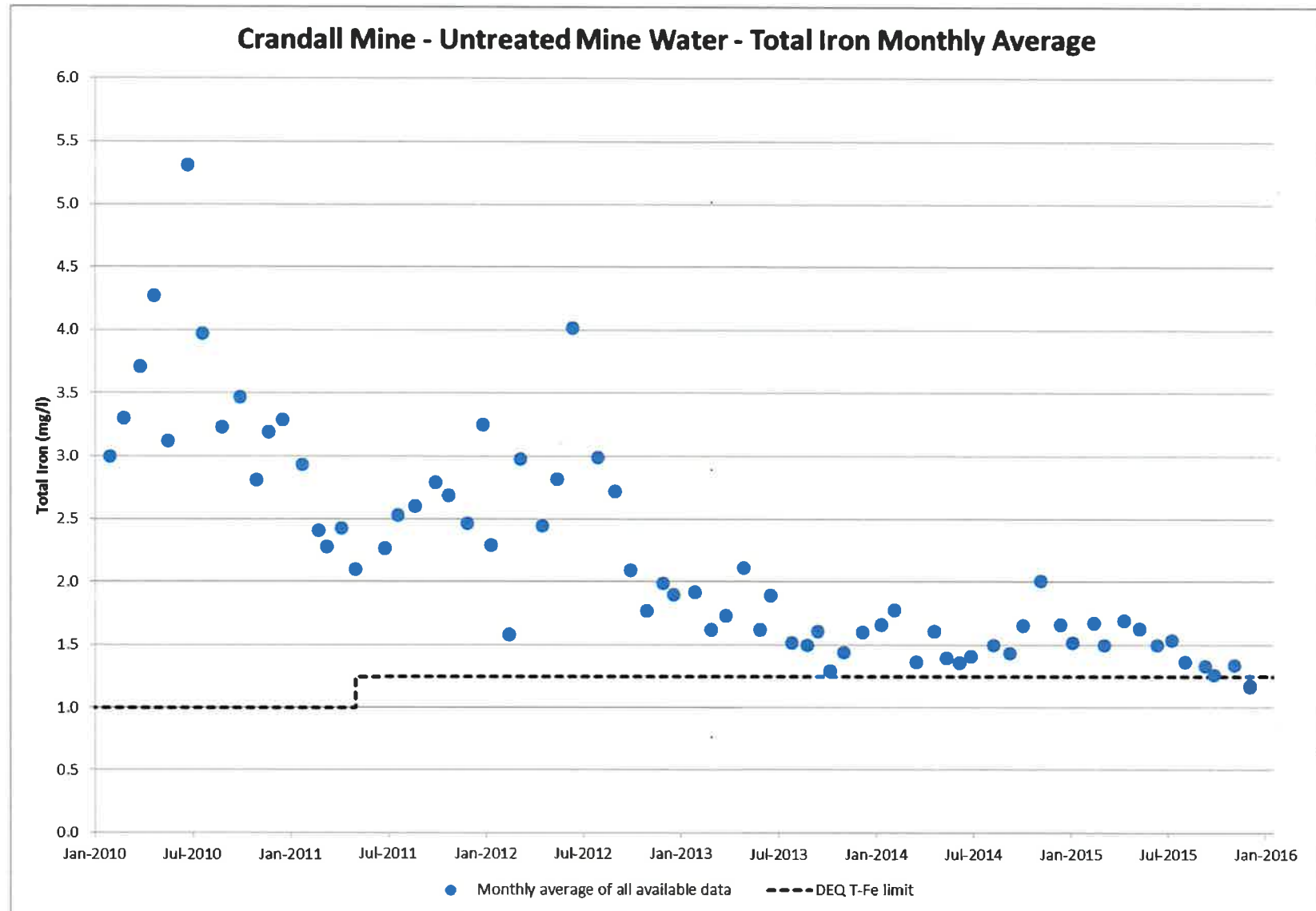


Exhibit 3

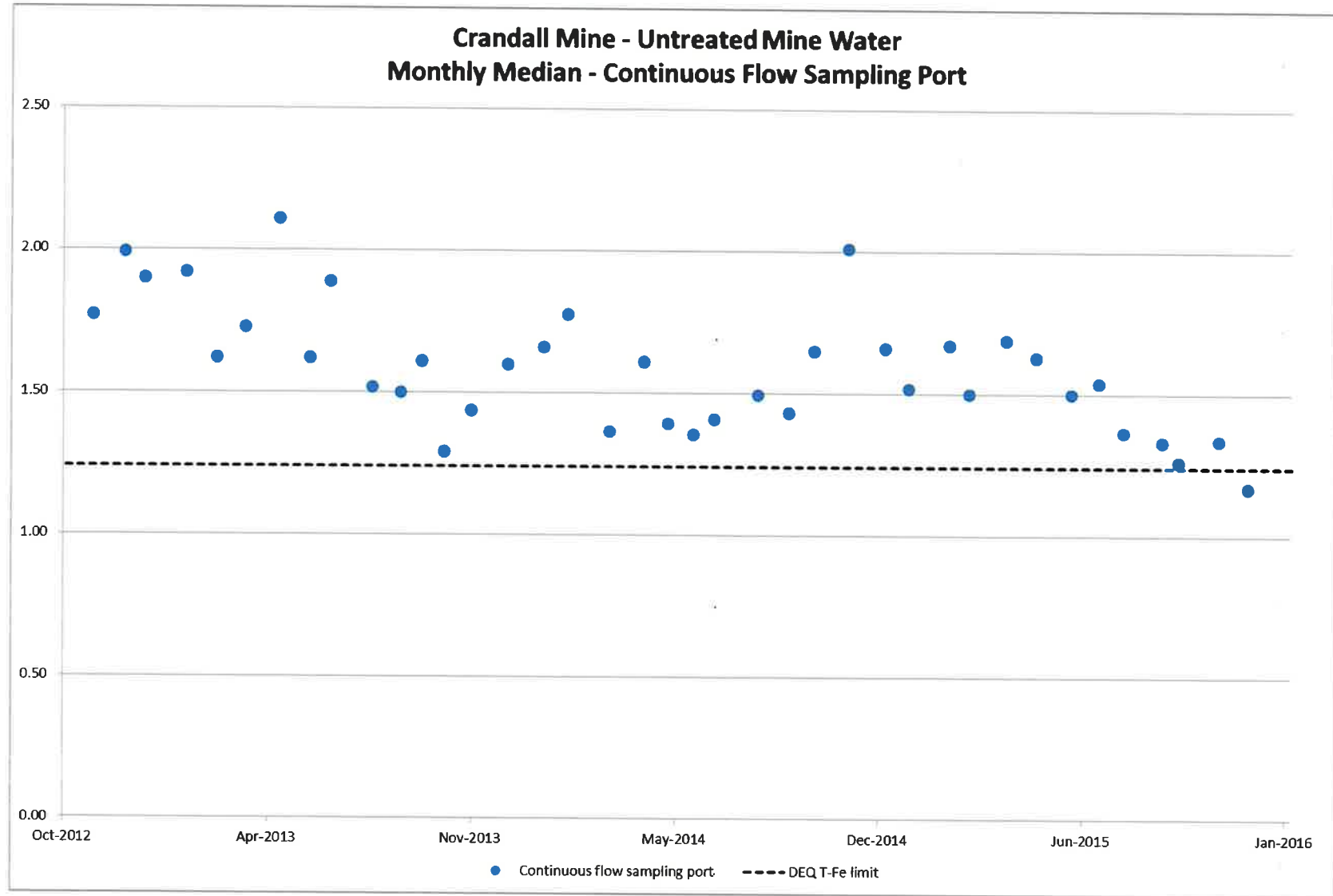


Exhibit 4

Mine Discharge

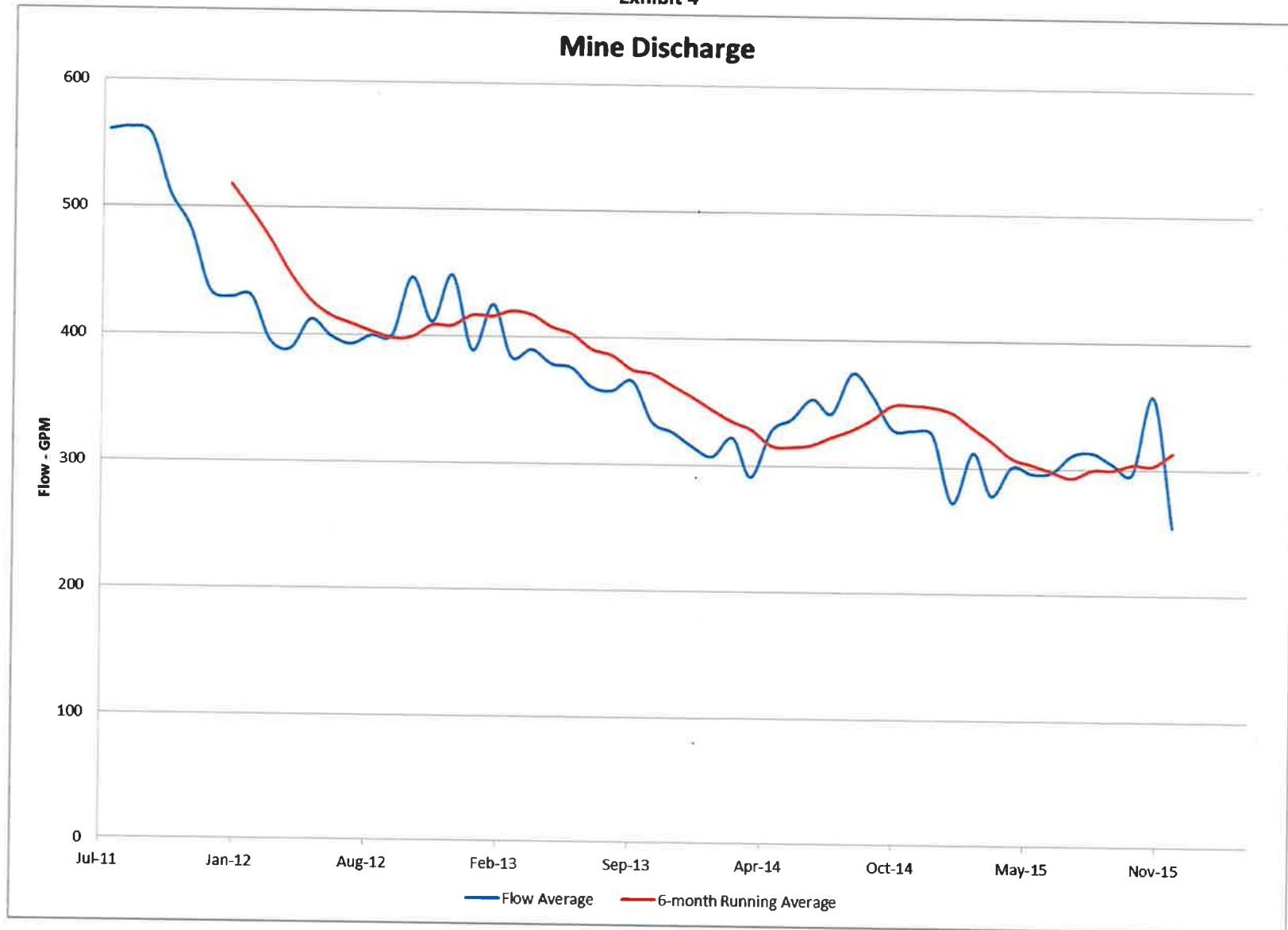


Exhibit 5

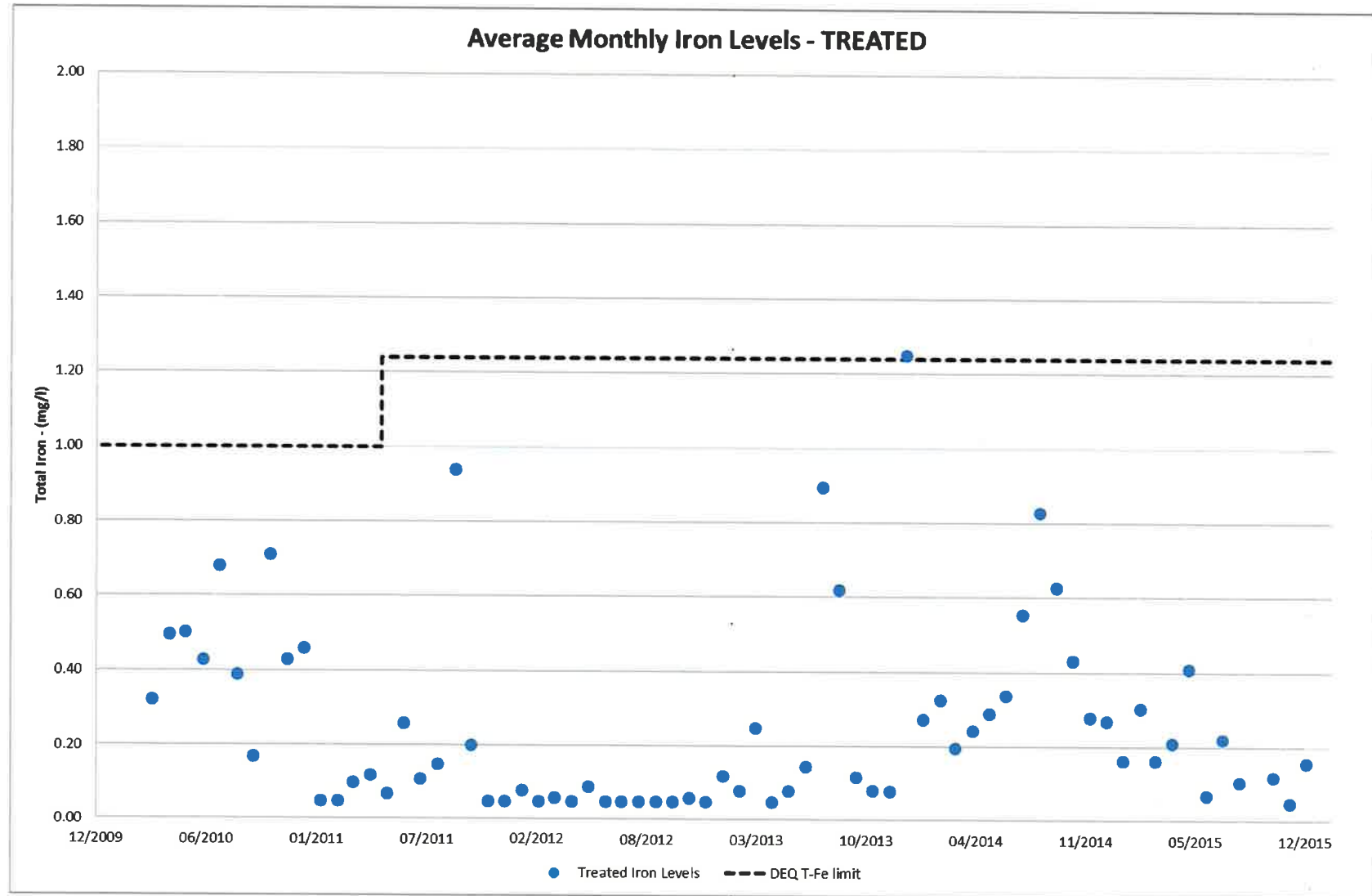


Exhibit 6

Sample Date	Total iron (mg/L) pretreatment sampling results	Continuous Flow Sampling Port	Genwal (G) or Division (D) Sample	Monthly Median
total iron (mg/L)				
1/8/2007	0.012		G	
2/6/2007	0.015		G	
3/7/2007	0.033		G	
4/18/2007	0.013		G	
5/1/2007	< .005		G	
6/13/2007	0.012		G	
7/16/2007	< .01		G	
8/30/2007	0.64		G	
9/11/2007	0.073		G	
10/15/2007	no flow		G	
11/15/2007	no flow		G	
12/15/2007	no flow		G	
1/10/2008	0.937		G	
1/28/2008	1.491		G	
2/11/2008	0.765		G	
2/18/2008	0.668		G	
3/3/2008	1.846		G	
3/17/2008	0.626		G	
4/1/2008	0.653		G	
4/15/2008	0.491		G	
5/5/2008	0.433		G	
5/14/2008	0.457		G	
6/1/2008	0.448		G	
7/16/2008	0.434		G	
8/14/2008	0.546		G	
9/9/2008	0.775		G	
10/10/2008	1.335		G	
11/15/2008	0.141		G	
12/9/2008	1.569		G	
1/7/2009	1.783		G	
2/3/2009	2.454		G	
3/4/2009	2.23		G	
4/6/2009	2.455		G	

Sample Date	Total iron (mg/L) pretreatment sampling results	Continuous Flow Sampling Port	Genwal (G) or Division (D) Sample	Monthly Median
total iron (mg/L)				
5/6/2009	2.331		G	
6/3/2009	2.501		G	
7/29/2009	2.924		G	
8/24/2009	5.151		G	5.15
9/3/2009	3.012		G	3.01
10/28/2009	8.03		G	8.03
11/18/2009	3.927		G	3.93
12/16/2009	3.102		G	3.10
1/28/2010	3.000		G	3.00
2/23/2010	3.300		G	3.30
3/26/2010	3.709		G	3.71
4/21/2010	4.268		G	4.27
5/18/2010	3.119		G	3.12
6/23/2010	5.312		G	5.31
7/21/2010	3.970		G	3.97
8/27/2010	3.230		G	3.23
9/29/2010	3.470		G	3.47
10/29/2010	2.810		G	2.81
11/22/2010	3.190		G	3.19
12/17/2010	3.290		G	3.29
1/24/2011	2.930		G	2.93
2/23/2011	2.410		G	2.41
3/10/2011	2.340		G	2.28
3/10/2011	1.98		D	
3/17/2011	2.180		G	
3/17/2011	2.06		D	
3/24/2011	2.390		G	
3/24/2011	2.28		D	
3/28/2011	2.310		G	
3/30/2011	2.360		G	
3/30/2011	2.04		D	

Sample Date	Total iron (mg/L) pretreatment sampling results	Continuous Flow Sampling Port	Genwal (G) or Division (D) Sample	Monthly Median
total iron (mg/L)				
4/7/2011	2.390		G	2.43
4/7/2011	2.15		D	
4/14/2011	2.250		G	
4/14/2011	2.11		D	
4/19/2011	2.620		G	
4/19/2011	2.43		D	
4/26/2011	2.550		G	
4/27/2011	6.680		G	
4/27/2011	5.00		D	
5/3/2011	2.050		G	2.10
5/3/2011	2.02		D	
5/12/2011	2.160		G	
5/12/2011	2.00		D	
5/17/2011	2.560		G	
5/17/2011	2.33		D	
5/25/2011	2.07		D	
5/31/2011	2.130		G	
6/27/2011	2.270		G	2.27
7/21/2011	2.660		D	2.53
7/25/2011	2.400		G	
8/22/2011	2.600		G	2.60
9/30/2011	2.790		G	2.79
10/24/2011	1.750		G	2.69
10/25/2011	3.62		D	
11/28/2011	2.470		G	2.47
12/28/2011	3.250		G	3.25
1/12/2012	2.29		G	2.29
2/15/2012	1.58		G	1.58
3/7/2012	3.00		D	2.98
3/23/2012	2.96		G	
4/17/2012	2.45		G	2.45

Sample Date	Total iron (mg/L) pretreatment sampling results	Continuous Flow Sampling Port	Genwal (G) or Division (D) Sample	Monthly Median
total iron (mg/L)				
5/15/2012	2.73		G	2.82
5/15/2012	2.90		D	
6/12/2012	4.02		G	4.02
7/30/2012	2.99		G	2.99
8/31/2012	2.72		G	2.72
9/30/2012	2.09		G	2.09
10/30/2012		1.77	G	1.77
11/30/2012		1.99	G	1.99
12/20/2012		1.9	G	1.90
1/29/2013		1.92	G	1.92
2/28/2013		1.62	G	1.62
3/28/2013		1.73	G	1.73
4/30/2013		2.11	G	2.11
5/30/2013		1.65	G	1.62
6/19/2013		1.93	D	1.89
6/24/2013		1.85	G	
7/30/2013		1.47	D	1.52
7/30/2013		1.57	G	
8/27/2013		1.44	D	1.49
8/28/2013		1.54	G	
8/29/2013		1.52	G	
9/17/2013		1.48	D	1.51
9/17/2013		1.54	G	
9/26/2013		1.81	G	
10/9/2013		1.71	D	1.59
10/9/2013		1.46	G	
10/17/2013		0.74	G	
10/24/2013		1.35	G	

Sample Date	Total iron (mg/L) pretreatment sampling results	Continuous Flow Sampling Port	Genwal (G) or Division (D) Sample	Monthly Median
total iron (mg/L)				
11/4/2013		1.19	G	1.31
11/8/2013		1.43	G	
11/14/2013		1.46	G	
11/19/2013		1.49	D	
11/19/2013		1.54	G	
11/26/2013		1.52	G	
12/10/2013		1.65	G	1.60
12/10/2013		1.48	D	
12/12/2013		1.65	G	
12/17/2013		1.51	G	
12/26/2013		1.71	G	
1/14/2014		1.53	G	1.66
1/22/2014		1.72	G	
1/28/2014		1.74	G	
1/28/2014		1.65	D	
2/7/2014		1.91	G	1.78
2/26/2014		1.68	G	
2/26/2014		1.74	D	
3/20/2014		1.29	G	1.37
3/25/2014		1.46	G	
3/25/2014		1.33	D	
3/31/2014		1.38	G	
4/23/2014		1.74	G	1.61
4/30/2014		1.48	G	
5/16/2014		1.38	G	1.39
5/23/2014		1.37	G	
5/28/2014		1.33	D	
5/29/2014		1.49	G	
6/10/2014		1.39	G	1.36
6/10/2014		1.32	D	

Sample Date	Total iron (mg/L) pretreatment sampling results	Continuous Flow Sampling Port	Genwal (G) or Division (D) Sample	Monthly Median
total iron (mg/L)				
7/1/2014		1.44	G	1.41
7/1/2014		1.38	D	
8/13/2014		1.42	G	1.50
8/19/2014		1.61	G	
8/19/2014		1.46	D	
9/12/2014		1.49	G	1.43
9/15/2014		1.37	D	
9/29/2014		1.44	G	
10/7/2014		1.48	D	1.65
10/9/2014		1.81	G	
10/20/2014		1.66	G	
11/10/2014		2.99	G	2.01
11/24/2014		1.58	G	
11/25/2014		1.46	D	
12/16/2014		1.58	D	1.66
12/16/2014		1.74	G	
1/8/2015		1.59	G	1.52
1/27/2015		1.45	D	
2/17/2015		1.77	G	1.67
2/23/2015		1.55	D	
2/23/2015		1.70	G	
3/9/2015		1.59	G	1.50
3/17/2015		1.40	D	
4/14/2015		1.82	G	1.69
4/30/2015		1.55	D	
5/13/2015		1.63	D	1.63
5/13/2015		1.63	G	
6/17/2015		1.52	G	1.50
6/22/2015		1.47	D	
6/29/2015		1.52	G	

Sample Date	Total iron (mg/L) pretreatment sampling results	Continuous Flow Sampling Port	Genwal (G) or Division (D) Sample	Monthly Median
total iron (mg/L)				
7/14/2015		1.54	G	1.54
8/6/2015		1.29	D	1.37
8/7/2015		1.44	G	
9/14/2015		1.33	G	1.33
10/1/2015		1.22	G	1.26
10/5/2015		1.33	G	
10/20/2015		1.24	D	
11/9/2015		1.45	G	1.34
11/16/2015		1.22	D	
12/8/2015		1.18	G	1.17
12/8/2015		1.16	D	